FIG. 1

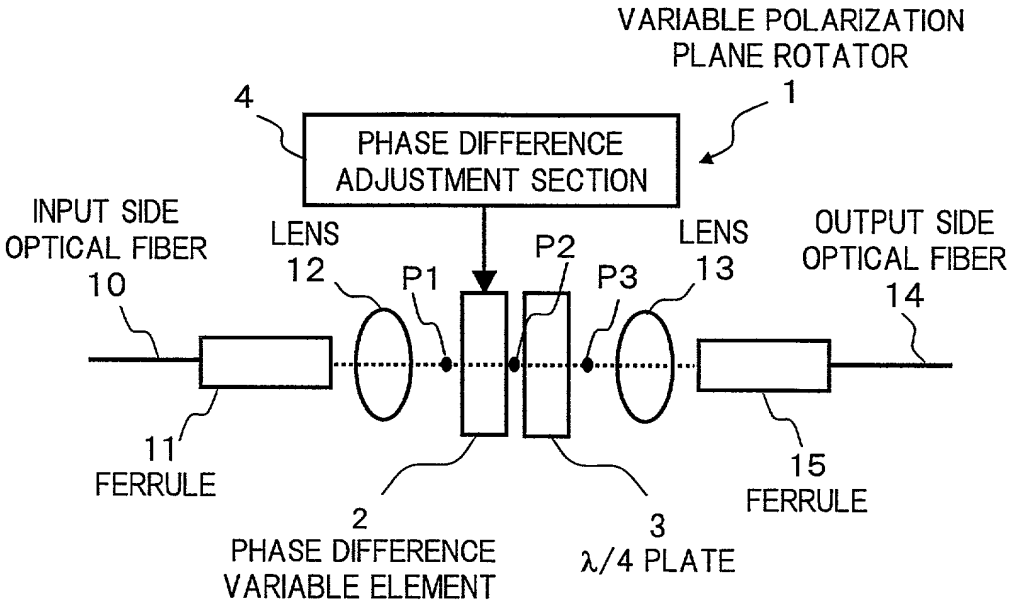
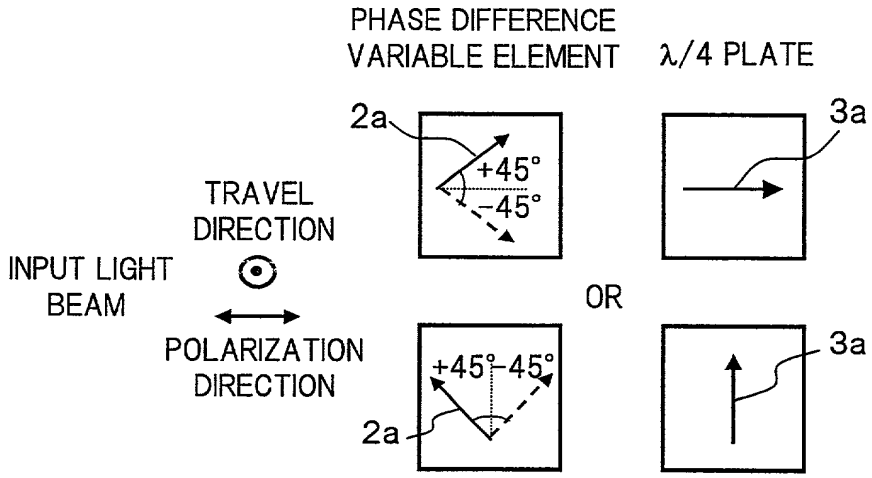

VARIABLE POLARIZATION PLANE ROTATOR
1
4
PHASE DIFFERENCE ADJUSTMENT SECTION
INPUT SIDE OPTICAL FIBER
10
LENS
12
P1
P2
P3
LENS
13
OUTPUT SIDE OPTICAL FIBER
14
11
FERRULE
15
FERRULE
2
PHASE DIFFERENCE VARIABLE ELEMENT
3
λ/4 PLATE

FIG. 2


PHASE DIFFERENCE VARIABLE ELEMENT
λ/4 PLATE
2a
+45°
-45°
3a
TRAVEL DIRECTION
INPUT LIGHT BEAM
POLARIZATION DIRECTION
OR
+45°
-45°
2a
3a

# FIG. 3

POLARIZATION STATE AT EACH POINT

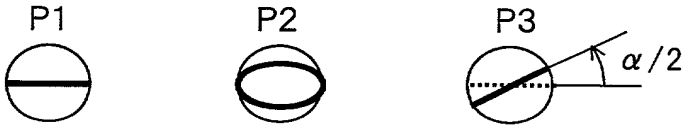


FIG. 4A

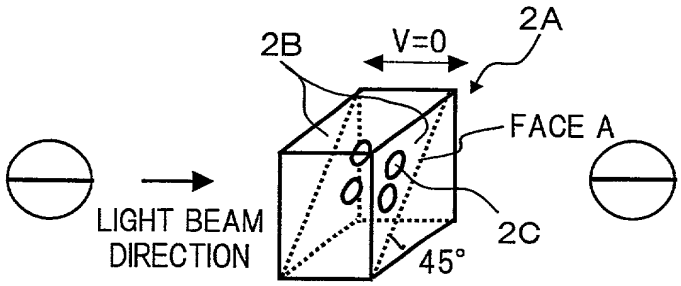



FIG. 4B

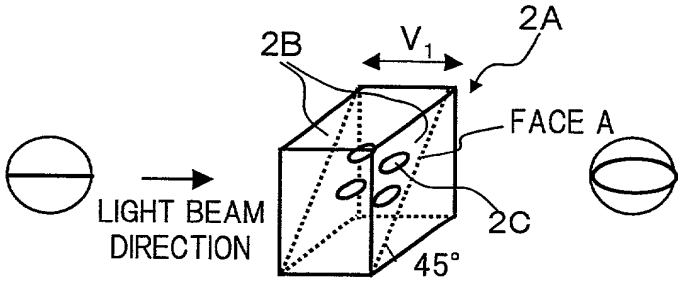



FIG. 4C

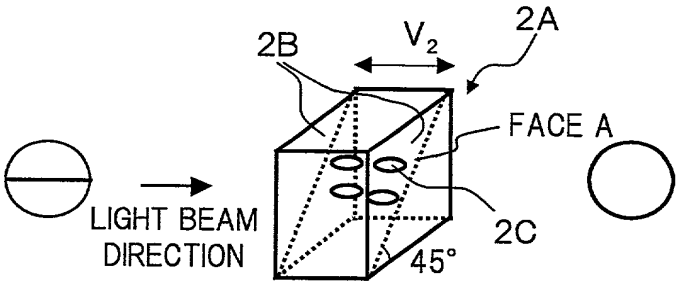



FIG. 4D

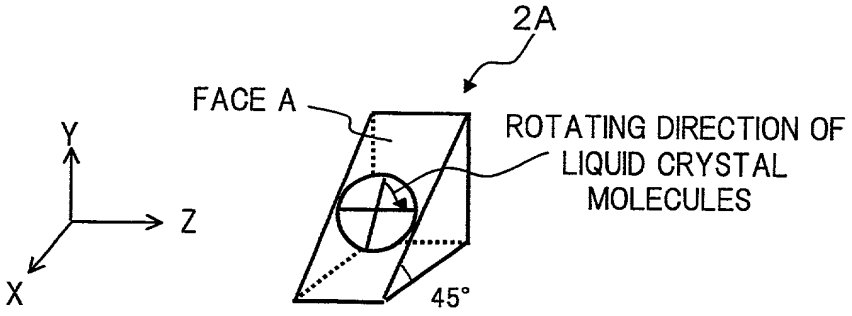


FIG. 5

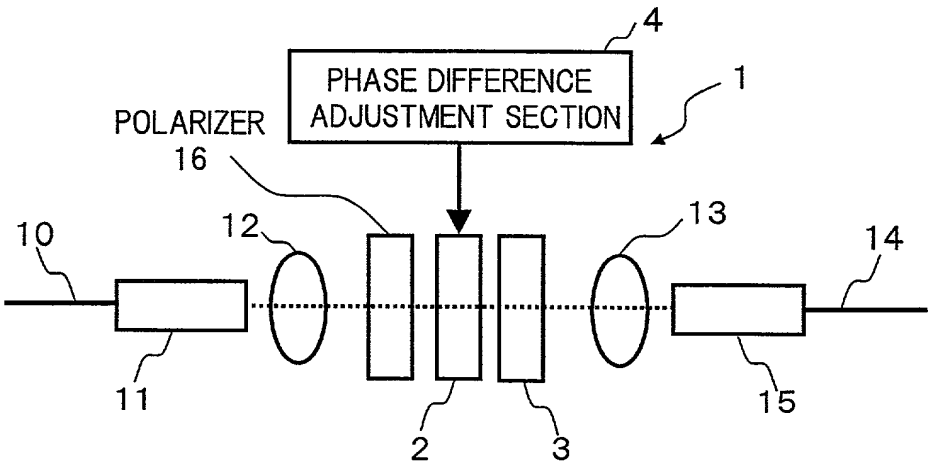

4
PHASE DIFFERENCE ADJUSTMENT SECTION
1
POLARIZER
16
10
12
13
14
11
15
2
3

FIG. 6

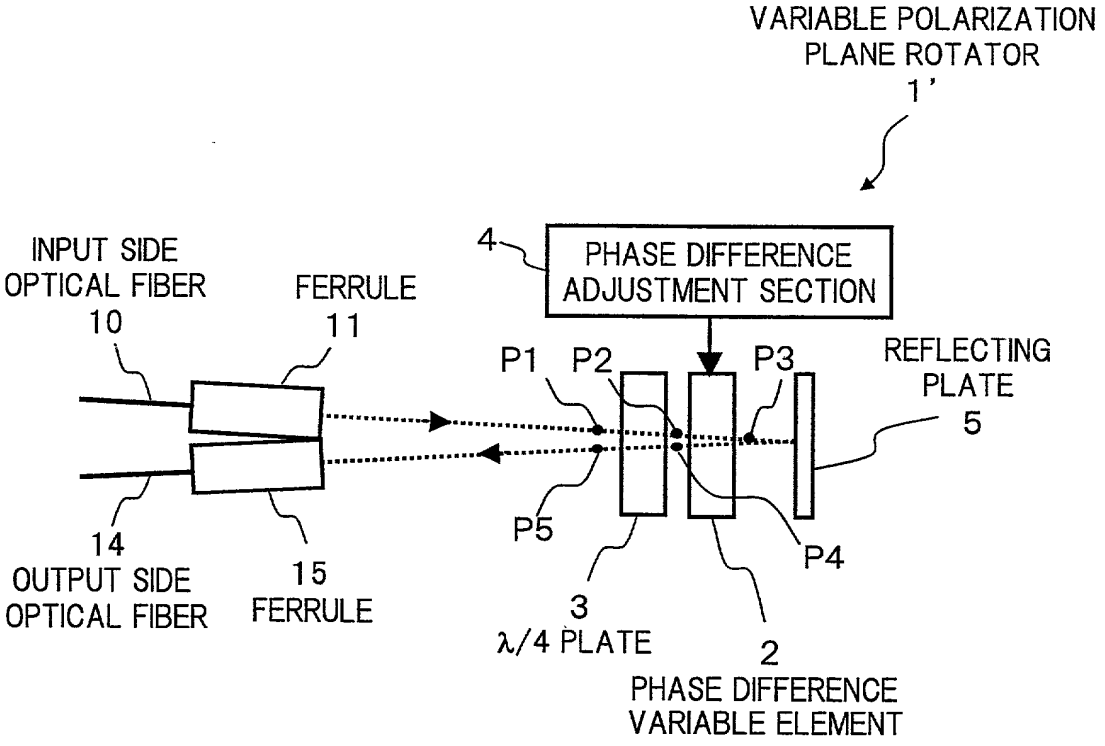

VARIABLE POLARIZATION PLANE ROTATOR
1'
INPUT SIDE OPTICAL FIBER
10
FERRULE
11
4
PHASE DIFFERENCE ADJUSTMENT SECTION
P1
P2
P3
REFLECTING PLATE
5
P5
P4
14
OUTPUT SIDE OPTICAL FIBER
15
FERRULE
3
λ/4 PLATE
2
PHASE DIFFERENCE VARIABLE ELEMENT

FIG. 7

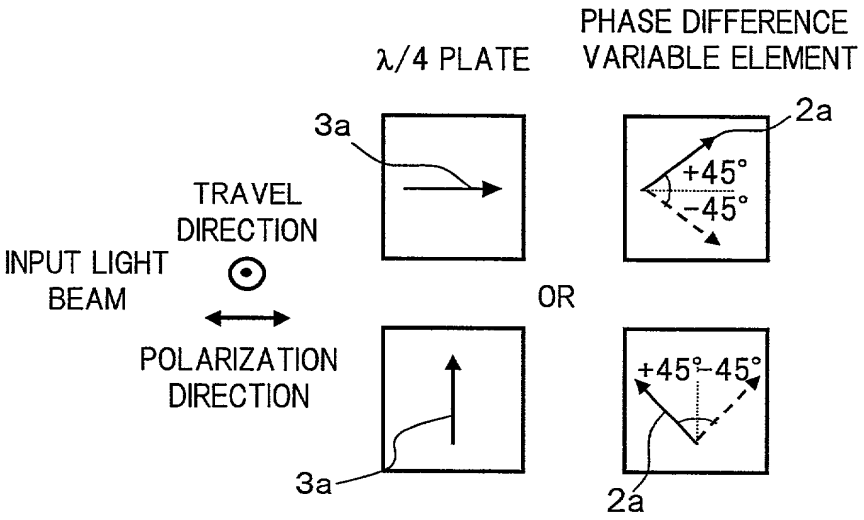

λ/4 PLATE
PHASE DIFFERENCE VARIABLE ELEMENT
3a
2a
+45°
-45°
TRAVEL DIRECTION
INPUT LIGHT BEAM
OR
POLARIZATION DIRECTION
+45°-45°
3a
2a

FIG. 8

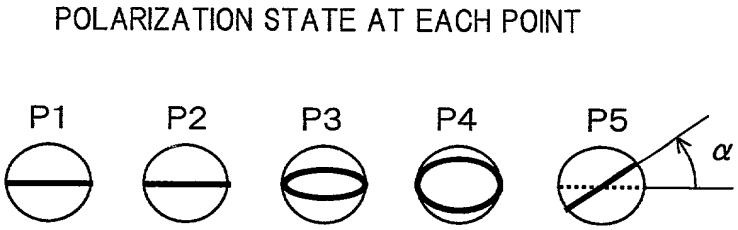

POLARIZATION STATE AT EACH POINT
P1
P2
P3
P4
P5
α

FIG. 9

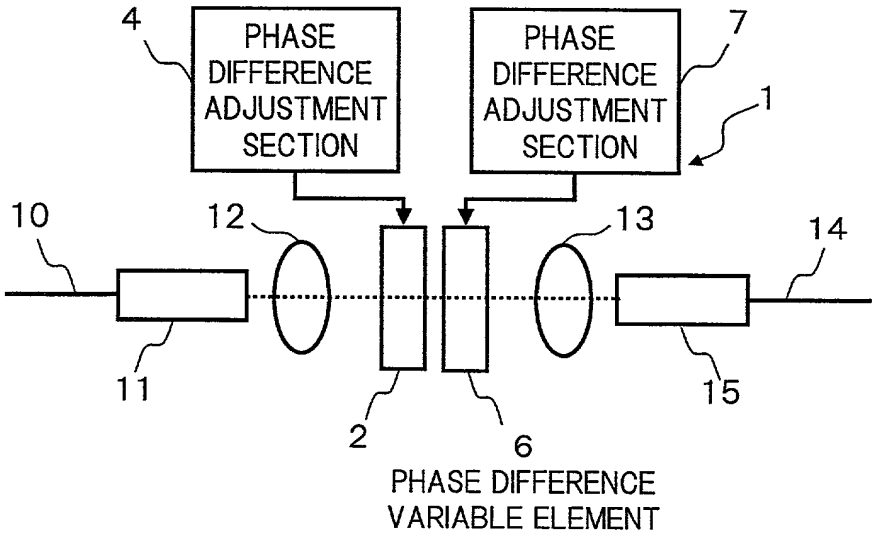

4
PHASE DIFFERENCE ADJUSTMENT SECTION
PHASE DIFFERENCE ADJUSTMENT SECTION
7
1
10
12
13
14
11
15
2
6
PHASE DIFFERENCE VARIABLE ELEMENT

FIG. 10

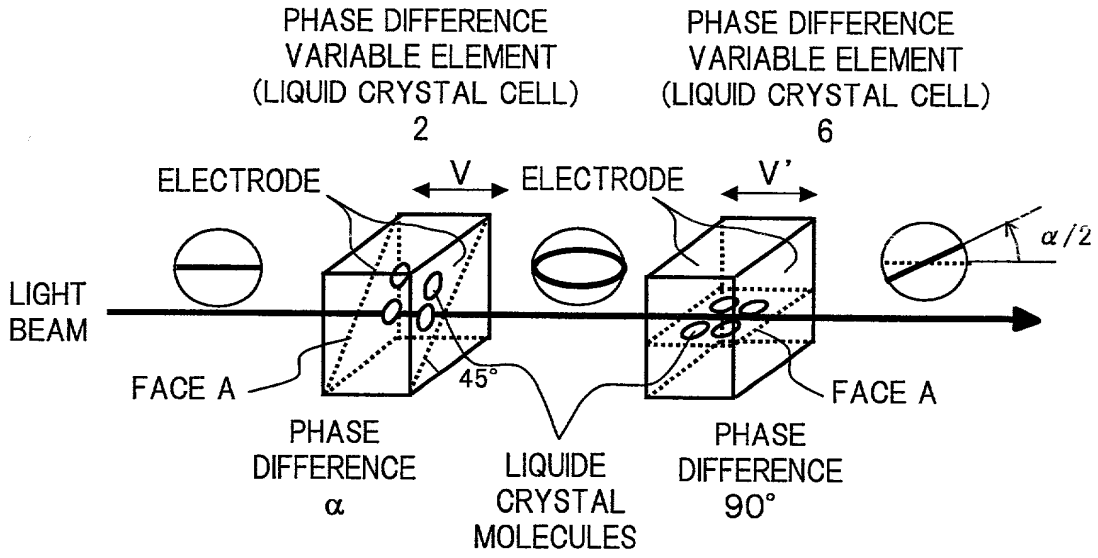

PHASE DIFFERENCE VARIABLE ELEMENT (LIQUID CRYSTAL CELL) 2
PHASE DIFFERENCE VARIABLE ELEMENT (LIQUID CRYSTAL CELL) 6
ELECTRODE
V
ELECTRODE
V'
α/2
LIGHT BEAM
FACE A
45°
FACE A
PHASE DIFFERENCE α
LIQUIDE CRYSTAL MOLECULES
PHASE DIFFERENCE 90°

FIG. 11

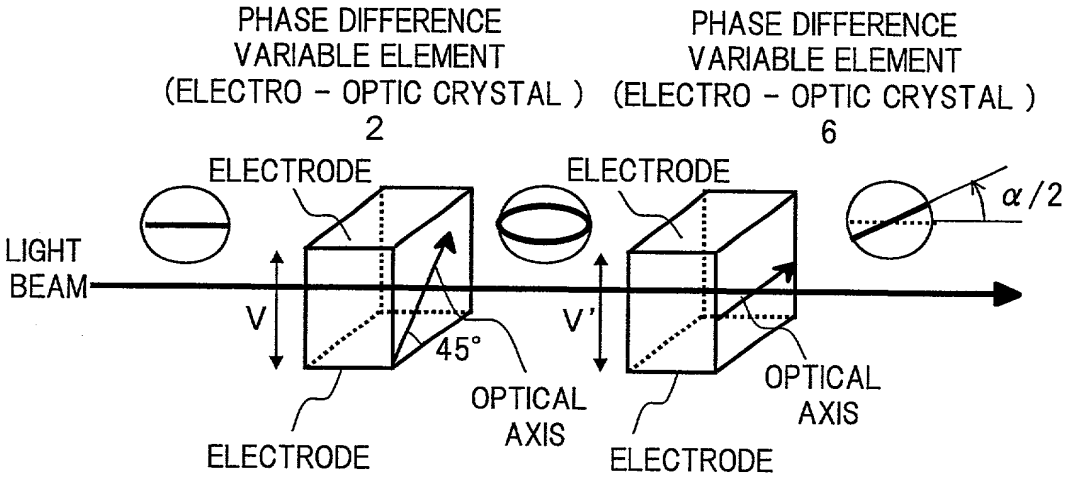

PHASE DIFFERENCE VARIABLE ELEMENT (ELECTRO - OPTIC CRYSTAL ) 2
PHASE DIFFERENCE VARIABLE ELEMENT (ELECTRO - OPTIC CRYSTAL ) 6
ELECTRODE
ELECTRODE
α/2
LIGHT BEAM
V
V'
45°
OPTICAL AXIS
OPTICAL AXIS
ELECTRODE
ELECTRODE

FIG. 12

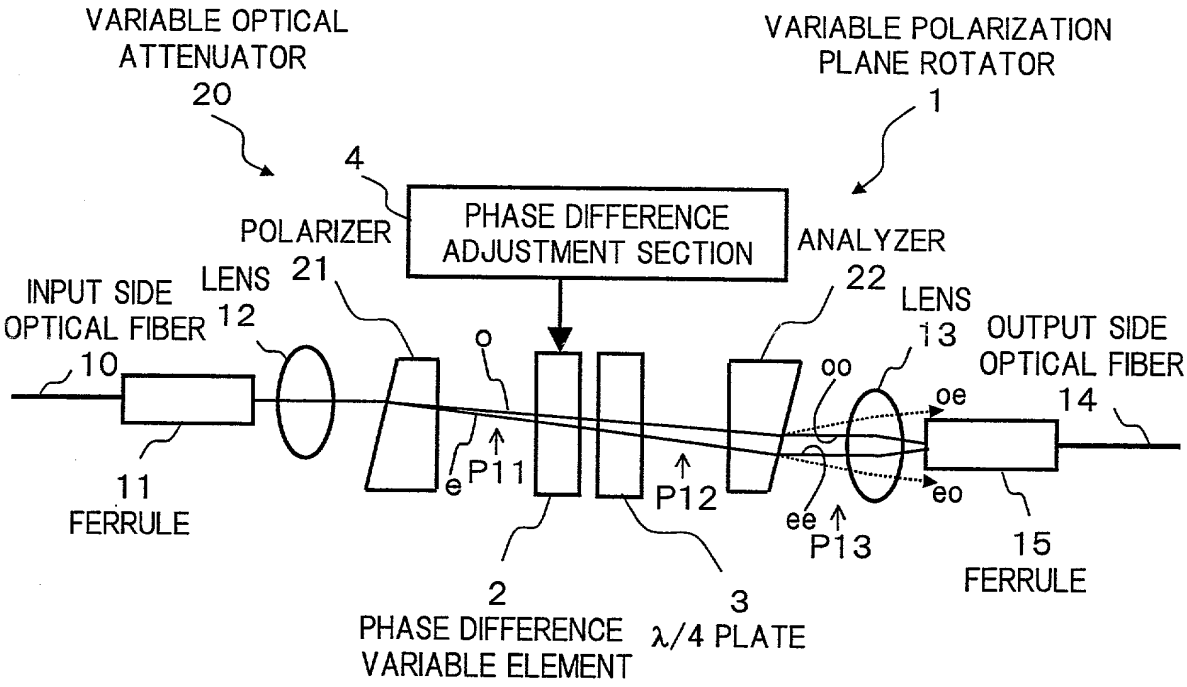

VARIABLE OPTICAL ATTENUATOR 20
VARIABLE POLARIZATION PLANE ROTATOR 1
4
POLARIZER
PHASE DIFFERENCE ADJUSTMENT SECTION
ANALYZER 22
INPUT SIDE OPTICAL FIBER 10
LENS 12
21
LENS 13
OUTPUT SIDE OPTICAL FIBER 14
o
oo
oe
e
P11
P12
ee
P13
eo
11 FERRULE
15 FERRULE
2 PHASE DIFFERENCE VARIABLE ELEMENT
3 λ/4 PLATE

FIG. 13

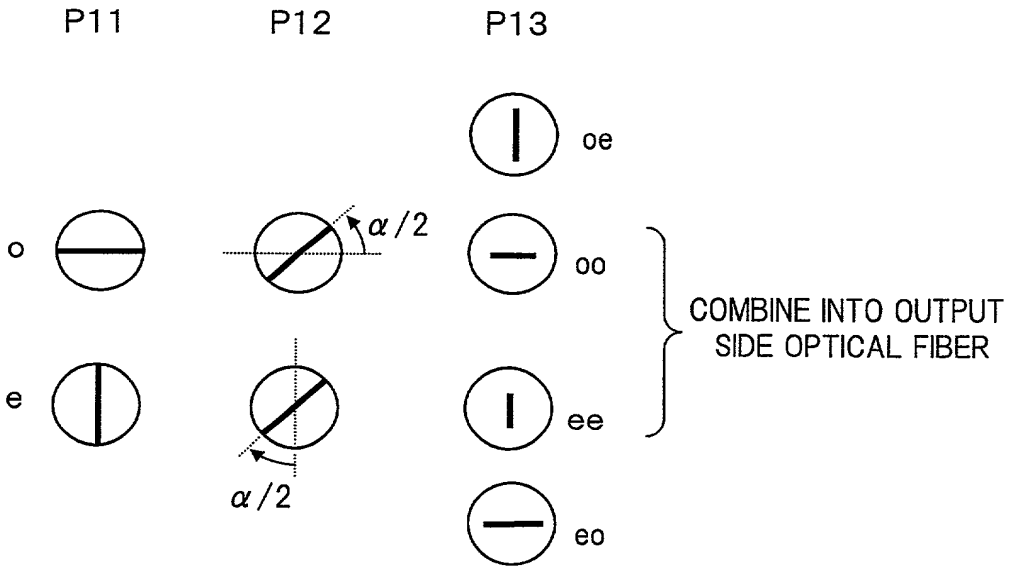

P11
P12
P13
o
e
α/2
α/2
oe
oo
ee
eo
COMBINE INTO OUTPUT SIDE OPTICAL FIBER

FIG. 14

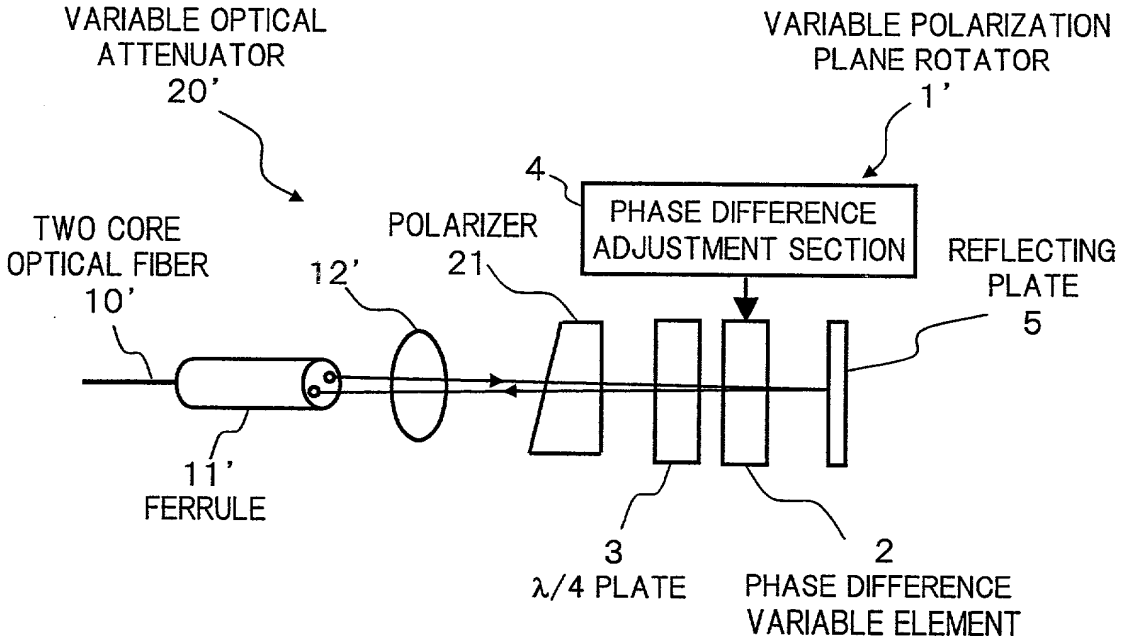

VARIABLE OPTICAL ATTENUATOR
20'
VARIABLE POLARIZATION PLANE ROTATOR
1'
4
PHASE DIFFERENCE ADJUSTMENT SECTION
TWO CORE OPTICAL FIBER
10'
POLARIZER
21
12'
REFLECTING PLATE
5
11'
FERRULE
3
λ/4 PLATE
2
PHASE DIFFERENCE VARIABLE ELEMENT

FIG. 15A

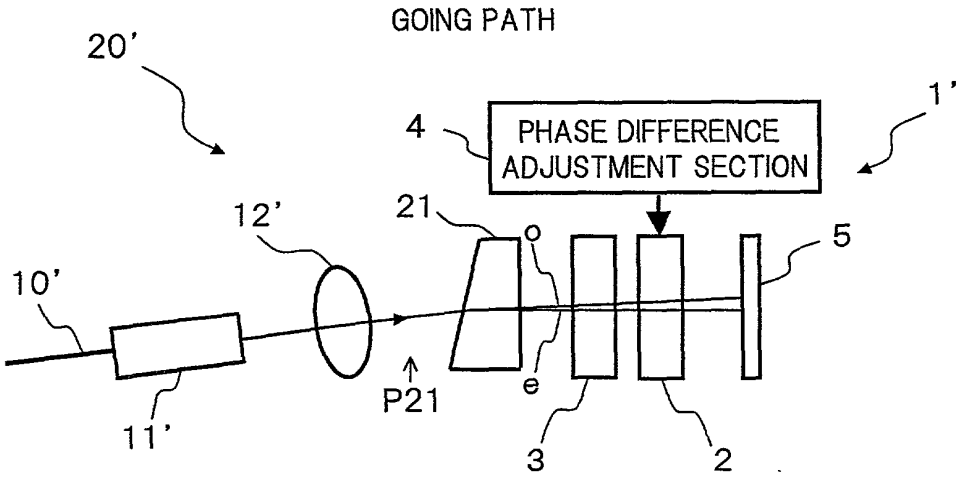



FIG. 15B

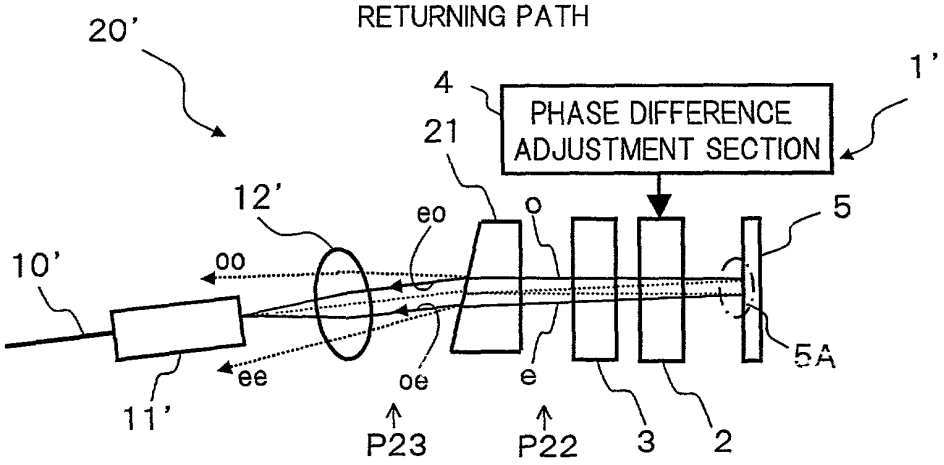


FIG. 16

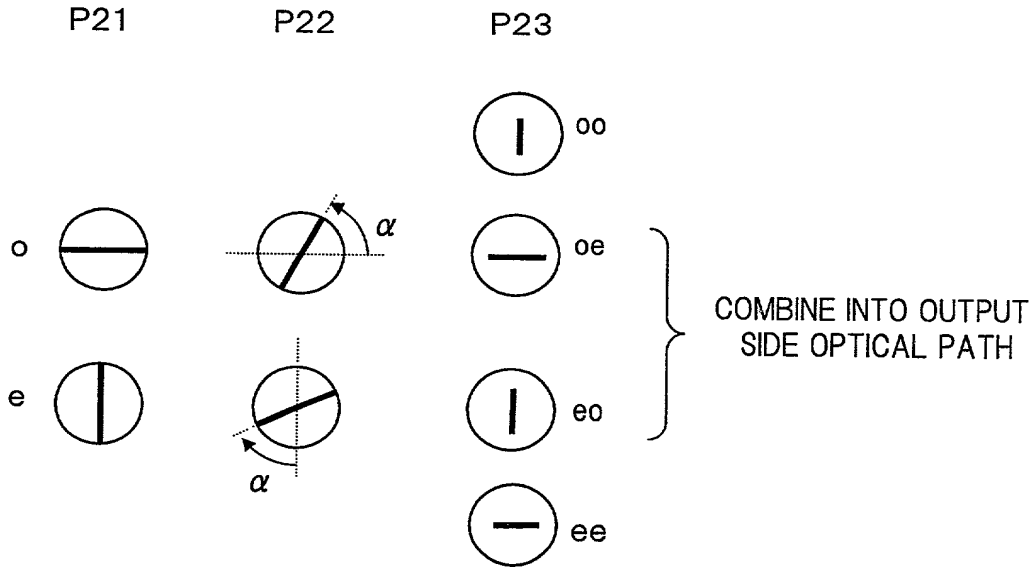

P21
P22
P23
oo
o
α
oe
COMBINE INTO OUTPUT SIDE OPTICAL PATH
e
eo
α
ee

FIG. 17

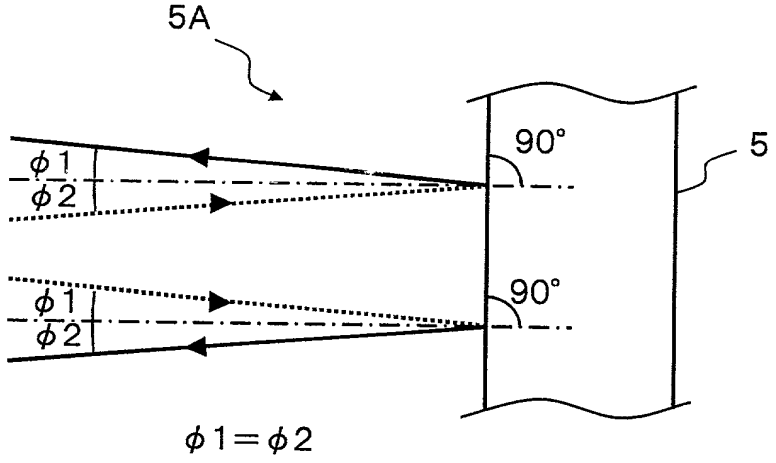

5A
90°
5
φ1
φ2
φ1
φ2
90°
φ1=φ2

FIG. 18

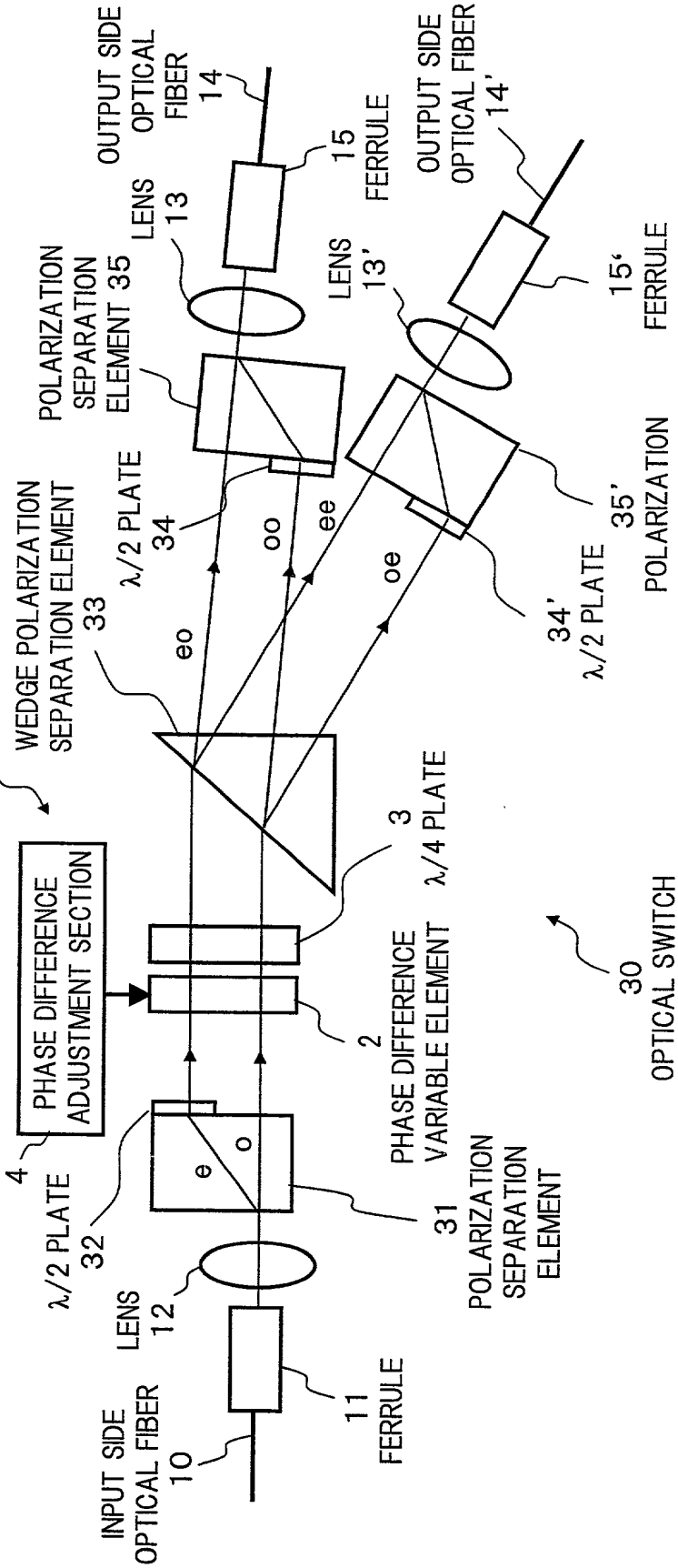

VARIABLE POLARIZATION PLANE ROTATOR
1
WEDGE POLARIZATION SEPARATION ELEMENT
33
PHASE DIFFERENCE ADJUSTMENT SECTION
4
λ/2 PLATE
32
INPUT SIDE OPTICAL FIBER
10
LENS
12
FERRULE
11
e
o
PHASE DIFFERENCE VARIABLE ELEMENT
2
λ/4 PLATE
3
POLARIZATION SEPARATION ELEMENT
31
OPTICAL SWITCH
30
eo
oo
ee
oe
λ/2 PLATE
34
POLARIZATION SEPARATION ELEMENT 35
LENS
13
FERRULE
15
OUTPUT SIDE OPTICAL FIBER
14
LENS
13'
FERRULE
15'
OUTPUT SIDE OPTICAL FIBER
14'
λ/2 PLATE
34'
POLARIZATION SEPARATION ELEMENT
35'

FIG. 19

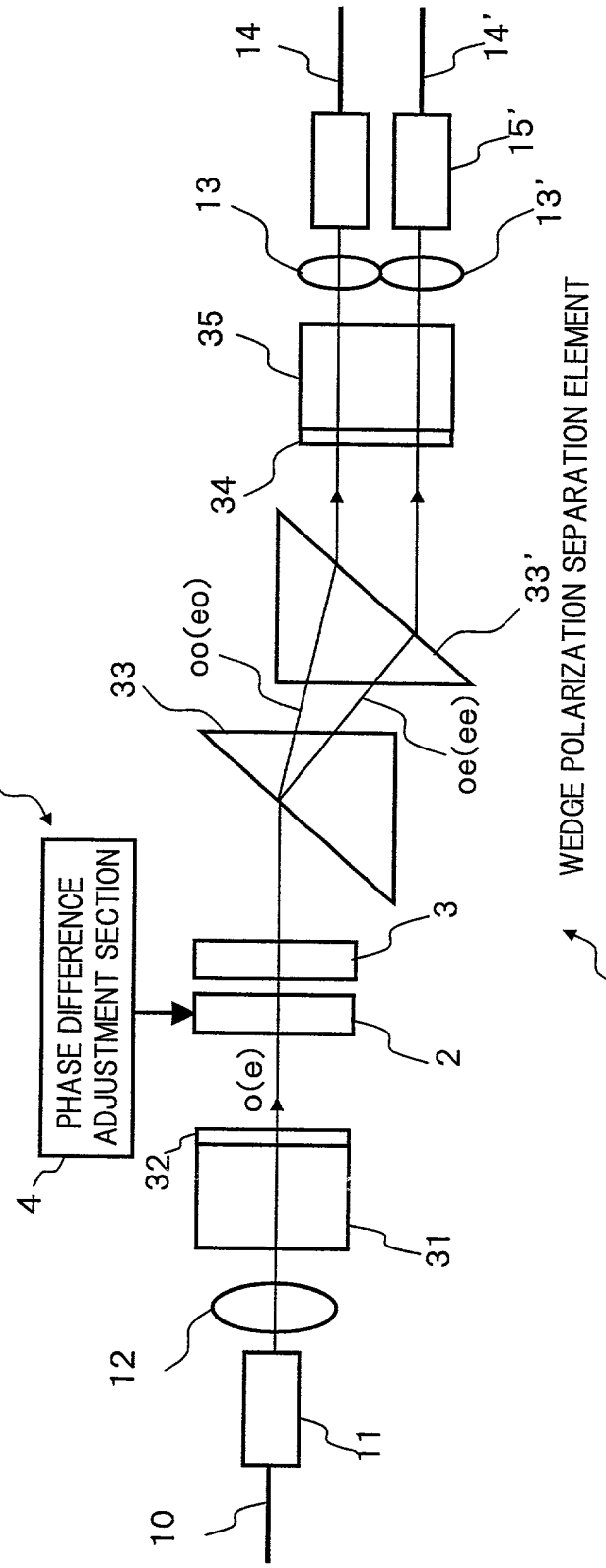

1
PHASE DIFFERENCE ADJUSTMENT SECTION
4
10
11
12
31
32
o(e)
2
3
33
oo(eo)
oe(ee)
33'
34
35
13
13'
15'
14
14'
WEDGE POLARIZATION SEPARATION ELEMENT
30'
OPTICAL SWITCH
(TOP VIEW)

FIG. 20

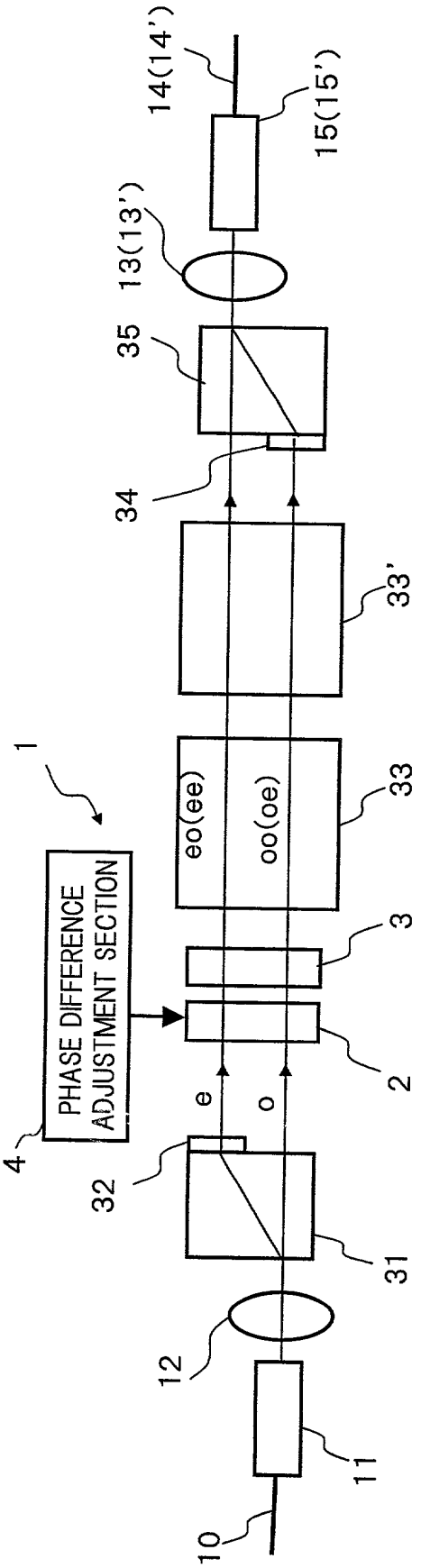

14(14')
15(15')
13(13')
35
34
33'
33
eo(ee)
oo(oe)
3
2
1
PHASE DIFFERENCE ADJUSTMENT SECTION
4
32
e
o
31
12
11
10
30'
(SIDE VIEW)

FIG. 21

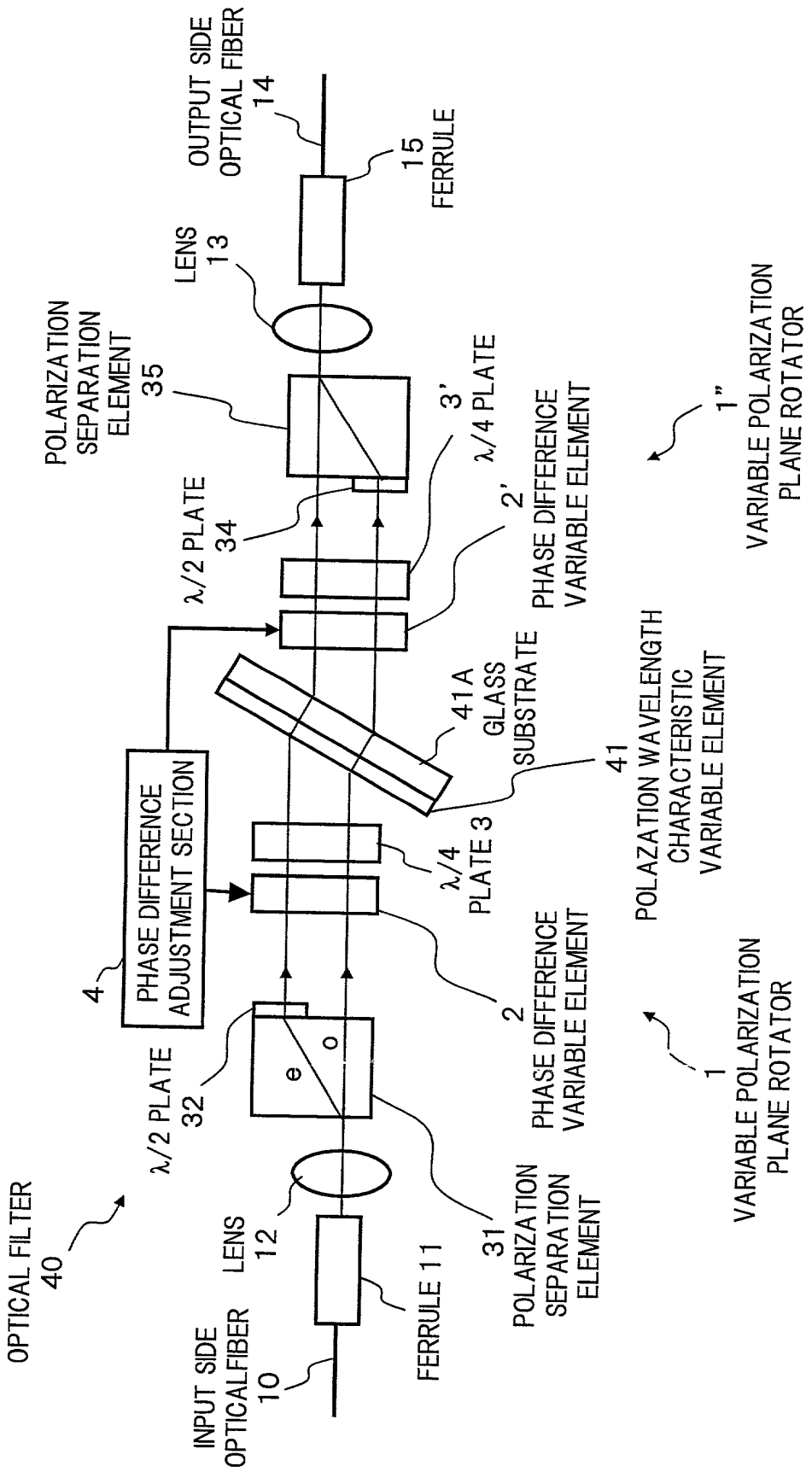

OPTICAL FILTER
40
INPUT SIDE OPTICALFIBER
10
FERRULE 11
LENS
12
λ/2 PLATE
32
4
PHASE DIFFERENCE ADJUSTMENT SECTION
2
PHASE DIFFERENCE VARIABLE ELEMENT
λ/4 PLATE 3
41
41A GLASS SUBSTRATE
POLARIZATION SEPARATION ELEMENT
31
1
VARIABLE POLARIZATION PLANE ROTATOR
POLAZATION WAVELENGTH CHARACTERISTIC VARIABLE ELEMENT
λ/2 PLATE
34
POLARIZATION SEPARATION ELEMENT
35
2'
PHASE DIFFERENCE VARIABLE ELEMENT
3'
λ/4 PLATE
LENS
13
OUTPUT SIDE OPTICAL FIBER
14
15
FERRULE
1"
VARIABLE POLARIZATION PLANE ROTATOR

FIG. 22

RELATED ART

